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(54) Method of Manufacturing a Stick and a Stick
Manufactured According to Said Method

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ABSTRACT OF THE DISCLOSURE

A method of manufacturing a hockey stick having the same properties as a conventional wood stick includes forming a cured core of polyurethane foam, with holes in a blade portion and a longitudinal groove in a handle portion, placing a reinforcement strip of glass-fiber reinforced polyester in the groove, winding a tape of woven glass fabric about the core, threading a hole of woven glass fabric on the outside of the tape, and applying a surface layer of polyester plastic on the core with reinforcements.

This invention relates to a method of manufacturing a stick, preferably for field-hockey or ice-hockey, and to a stick manufactured according to said method.

At present only field-hockey and ice-hockey sticks made of wood are used in practice. It is not only extremely difficult to procure the raw material (a special sort of wood) but these sticks, in addition, also are manufactured by a great variety of manufacturing operations, which are carried out manually. Such field-hockey and ice-hockey sticks, consequently, are extremely expensive to manufacture.

Attempts have also been made to manufacture sticks, especially ice-hockey sticks, of synthetic materials, but they apparently did not compare favourably with the sticks made of wood, because they never became established on the market.

It is therefore an object of the present invention to provide a method for the manufacture of a field-hockey or ice-hockey stick, which is extremely cheap to manufacture and, besides, has properties very similar to those of conventional wood sticks.

The present invention provides a method of manufacturing a stick, comprising the steps of forming a core of polyurethane foam having a handle portion and a blade portion, causing the foam to set, forming a plurality of holes in the blade portion, forming at least one longitudinal groove in the handle portion, laying a reinforcing strip into the groove, winding a tape of woven glass fabric about the core, drawing a hose of woven glass fabric upon the core on the outside of the tape, applying a layer of polyester plastic about the entire core with its reinforcements and, causing the polyester plastic to set.

The present invention further provides a stick, comprising a core of cured polyurethane foam, which core comprises a handle portion and a blade portion, at least one reinforcing strip in the core, a tape of woven glass fabric wound on the core, a hose of woven glass fabric threaded on the outside of the tape, and a surface layer of polyester plastic applied on the outside of the core and glass fiber reinforcements.

An embodiment of the invention is described in the following, with reference to the accompanying drawings, in which:-

Fig. 1 is a schematic view of a field hockey stick embodying the invention;

Fig. 2 is a section along II-II in Fig. 1;

Fig. 3 is a section along III-III in Fig. 1;

Fig. 4 is a schematic view of an ice-hockey stick embodying the invention;

Fig. 5 is a section along V-V in Fig. 4; and

Fig. 6 is a section along VI-VI in Fig. 4.

The stick shown in Figs. 1-3 comprises a handle portion 2, which at one end transforms to a curved blade portion 3.

The stick 1 is built up of a core 4 of polyurethane foam with a density of preferably 100-400 g/liter. In the core 4 a reinforcing strip 8, preferably of glass-fiber reinforced polyester, is attached. At the contact surface of the stick with the ice, furthermore, an additional reinforcing portion 5 of plastic sheet laminate or Teflon (Trade Mark) is located.

The first manufacturing step, i.e. the manufacture of the core 4, proceeds by injection of polyurethane foam into a foam mould. The density of the core 4 can be varied by varying the amount of polyurethane foam injected into the mould.

Subsequent to the setting of the foam, the mould is removed, and the core 4 is ready.

A longitudinal groove 5 is now sawn into the core 4 so as to extend from the free end of the handle portion 2 to the region of the blade portion 3, into which a plurality of holes 7 are drilled.

Into the groove 5 a reinforcing strip 8 of glass-fiber reinforced polyester i.e. so-called one-way roving, is laid. The reinforcing strip 8 has a thickness smaller than the width of the groove 5, as shown in Fig. 2. The height of the strip 8 is equal to the height of the groove 5.

The manufacturing process is continued by a tape 9 of directed glass fiber, i.e. so-called one-way roving, being wound about the core 4 from the free end of the blade portion 3 to the free end of the handle portion 2. The winding is made with some overlapping, which is greater in the blade portion 3 and an adjoining part of the handle portion 2. The tape 9 retains the reinforcing strip 8 in place in the groove 5.

Over the outside of the thus-wound tape 9 a hose 10 of diagonally woven glass fiber (roving 50-50) is drawn and extends all the way from the free end of the blade portion 3 to the free end of the handle portion 2. In this manufacturing phase the hose 10 has the object of keeping the tape 9 in place.

The core 4 with the reinforcing portion 5, reinforcing strip 8, tape winding 9 and hose 10 is placed into an injection mould, into which polyester plastic is injected which thereby forms a surface layer 11 about the entire core 4. See Figs. 2 and 3.

The polyester plastic also fills the holes 7 in the blade portion 3, whereby small plugs of polyester plastic are formed which extend transversely through the blade portion 3 and reinforce the same.

Due to the thickness of the reinforcing strip 8 being smaller than the width of the groove 5, the polyester plastic penetrates into the groove 5 and encloses the stip 8 on its two sides.

The polyester plastic also penetrates into the hose 10 and tape winding 9 all the way inward to the core 4.

Subsequent to the setting and mould removal, the stick is ground smooth and varnished.

When a stick is to be manufactured which meets very high strength requirements, glass fiber tapes 12 of directed type (roving 50-50) are applied on the sides of greater planeness, i.e. lesser curvature, of the handle portion 2 on the outside of the hose 10 before the core 4 with reinforcements is positioned in the injection mould.

The ice-hockey stick 1' shown in Figs. 4-6 is built up according to the same principle as the stick 1 shown in Figs. 1-3. The ice-hockey stick 1' comprises a handle portion 2' and a blade portion 3'.

In a manner corresponding to that for the stick 1, a core 4' is injection moulded. The stick, thus, can have different density and thereby vary in weight.

In the foam mould a reinforcing portion 6' is attached which, thus, is integrated with the core 4'.

As appears from Figs. 4 and 5, the handle portion 2' of the ice-hockey stick 1' is provided with three reinforcing strips 8' of glass-fiber reinforced polyester. This implies that three grooves 5' must be arranged. The strips 8' have a thickness smaller than the width of the grooves 5'.

The blade portion 3' is provided with a plurality of holes 7', preferably with a diameter of 3 mm.

In a manner corresponding to that for the stick 1, a tape 9' of directed glass fiber is wound about the core 4' along the entire length thereof. The tape 9' is overlapped by an amount which is greatest in the region of the blade portion 3' and adjacent part of the handle portion 2'.

Over the outside of the tape winding 9' a hose 10' of roving (90-10) is drawn and extends from the tip of the blade portion 3' to the free end of the handle portion 2'.

The core 4' with reinforcements is positioned in an injection mould and polyester plastic is then injected into the mould in a manner corresponding to that of the manufacture of the stick 1.

After setting, a surface layer 11' of polyester plastic is formed which preferably has a thickness of about

1.5 mm.

When a stick with an extra rigid handle portion 2' is desired, two additional reinforcing tapes 12' of roving (50-50) according to Fig. 5 are attached.

The manufacturing method described above renders it possible to manufacture, for example, field-hockey and ice-hockey sticks with desired weight distribution and strength properties.

The density of the core 4,4', for example, can be varied, certain reinforcements, for example the tapes 12,12', can be abandoned, reinforcements with certain special properties can be used, and the number of reinforcements, for example of the strips 8,8', can be varied.

It is, of course, also possible to apply the above method to the manufacture of sticks for sports other than field-hockey and ice-hockey.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of manufacturing a stick, comprising the steps of:

forming a core of polyurethane foam having a handle portion and a blade portion;

causing the foam to set;

forming a plurality of holes in the blade portion;

forming at least one longitudinal groove in the handle portion;

laying a reinforcing strip into the groove;

winding a tape of woven glass fabric about the core;

drawing a hose of woven glass fabric upon the core on the outside of the tape;

applying a layer of polyester plastic about the entire core with its reinforcements; and

causing the polyester plastic to set.

2. A method as defined in claim 1, wherein the polyester plastic fills the holes in the blade portion.

3. A method as defined in claim 1, wherein on the glass fiber hose tape of woven glass fabric is applied in the region of the handle portion before the layer of polyester plastic is applied.

4. A method as defined in claim 1, 2 or 3, wherein the tape is overlapped to an extent which is greatest on the blade portion and an adjoining part of the handle portion.

5. A method as defined in claim 1, 2 or 3, wherein the reinforcing strip comprises glass-fiber reinforced polyester.

6. A stick, comprising:

a core of cured polyurethane foam, which core comprises a handle portion and a blade portion;

at least one reinforcing strip in the core;

a tape of woven glass fabric wound on the core;

a hose of woven glass fabric threaded on the outside of the tape; and

a surface layer of polyester plastic applied on the outside of the core and glass fiber reinforcements.

7. A stick as defined in claim 6, wherein the blade portion is provided with holes, which are filled with the polyester plastic forming the surface layer.

8. A stick as defined in claim 6, wherein a reinforcing portion is connected to the core in the region of the blade portion.

9. A stick as defined in claim 6, 7 or 8, wherein a plurality of reinforcing strips each have a thickness smaller than the width of grooves in which the reinforcing strips are provided.

10. A stick as defined in claim 6, 7 or 8, wherein longitudinal tapes of woven glass fabric are applied on the handle portion between the hose and the surface layer.

11. A stick as defined in claim 6, 7 or 8, wherein the or each reinforcing strip comprises glass fiber reinforced polyester fabric.

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FIG. 1

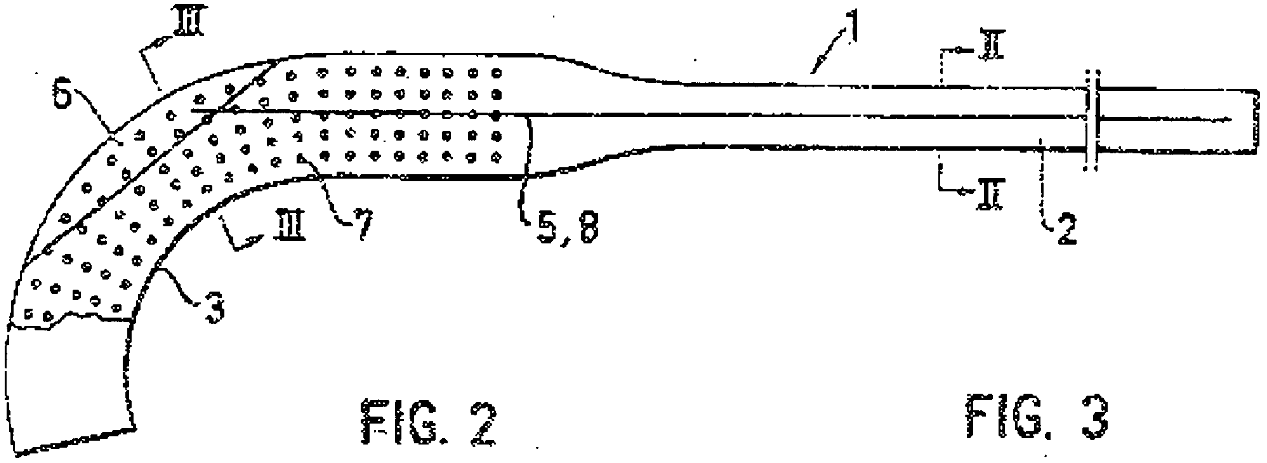

FIG. 2

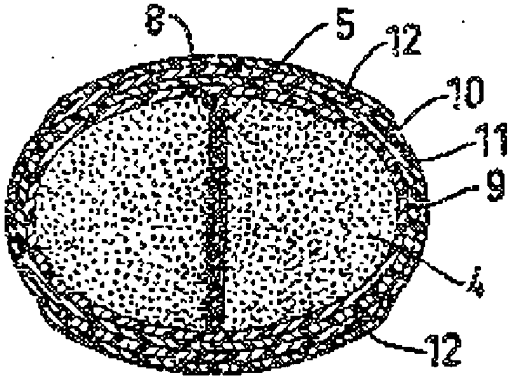

FIG. 3